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Yeh

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(54) **MEASURING APPARATUS FOR MICRO-AMOUNT OF MATERIALS**

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B65B 1/32 (2006.01)
G01G 19/22 (2006.01)

(52) **U.S. Cl.** **366/141**; 366/155.1; 366/179.1; 141/103; 414/21; 177/52

(58) **Field of Classification Search** 366/141, 366/155.1, 179.1; 141/103; 414/21; 177/52
See application file for complete search history.

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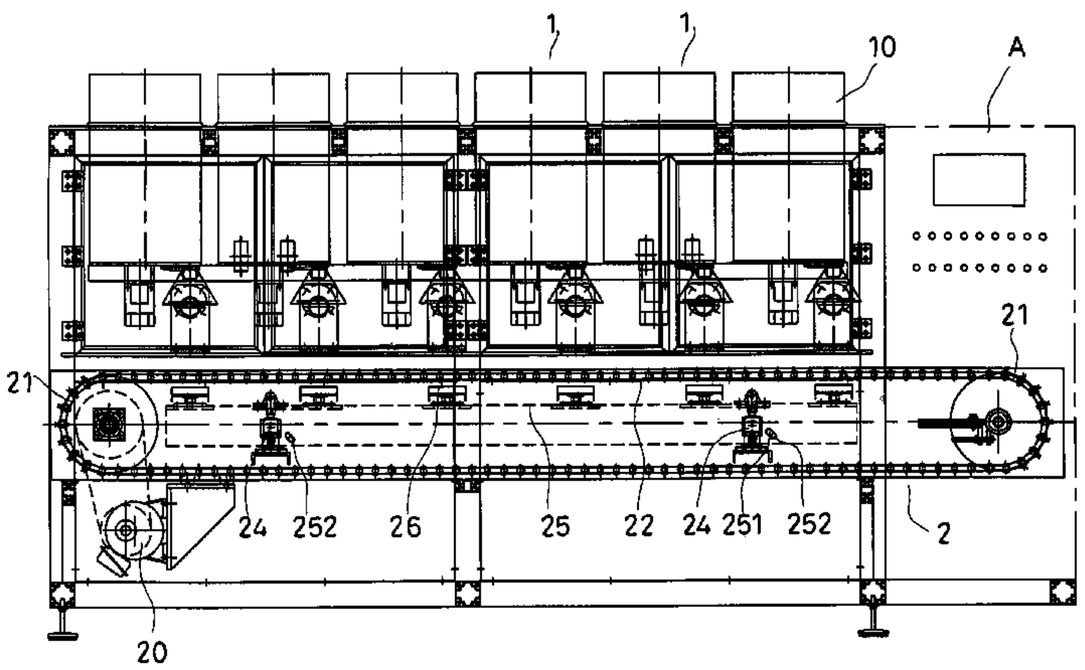
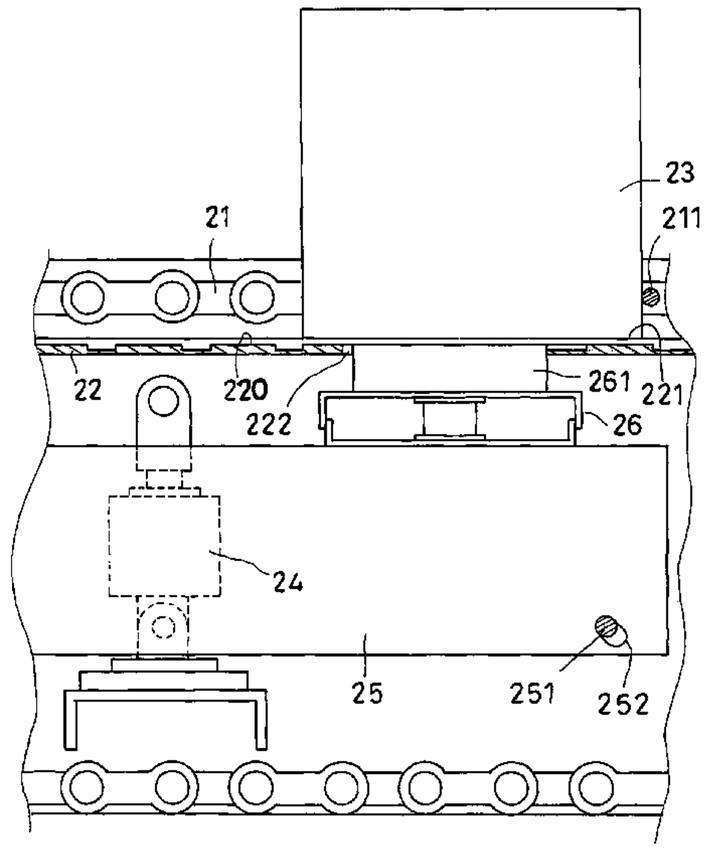
(57) **ABSTRACT**

A measuring apparatus includes several feeding mechanisms, a conveying mechanism, and receiving barrels as many as the feeding mechanisms; each feeding mechanism includes a storage barrel, a conduit connected to an outlet of the storage barrel, an elastic element in the conduit, and a transmission for rotating the elastic element so as to convey material forwards along the conduit; the conveying mechanism includes a guiding and bearing board for supporting the receiving barrels, a platform, a conveying machine for pushing the receiving barrels forwards, a propping power source for propping the platform upwards, and scales; the board has slots, and the scales are positioned on the platform for weighing materials added into the receiving barrels; each scale has propping rods thereon such that the scales will weigh materials added into the receiving barrels when moved up for the propping rods to pass through the slots and prop the receiving barrels.

3 Claims, 9 Drawing Sheets





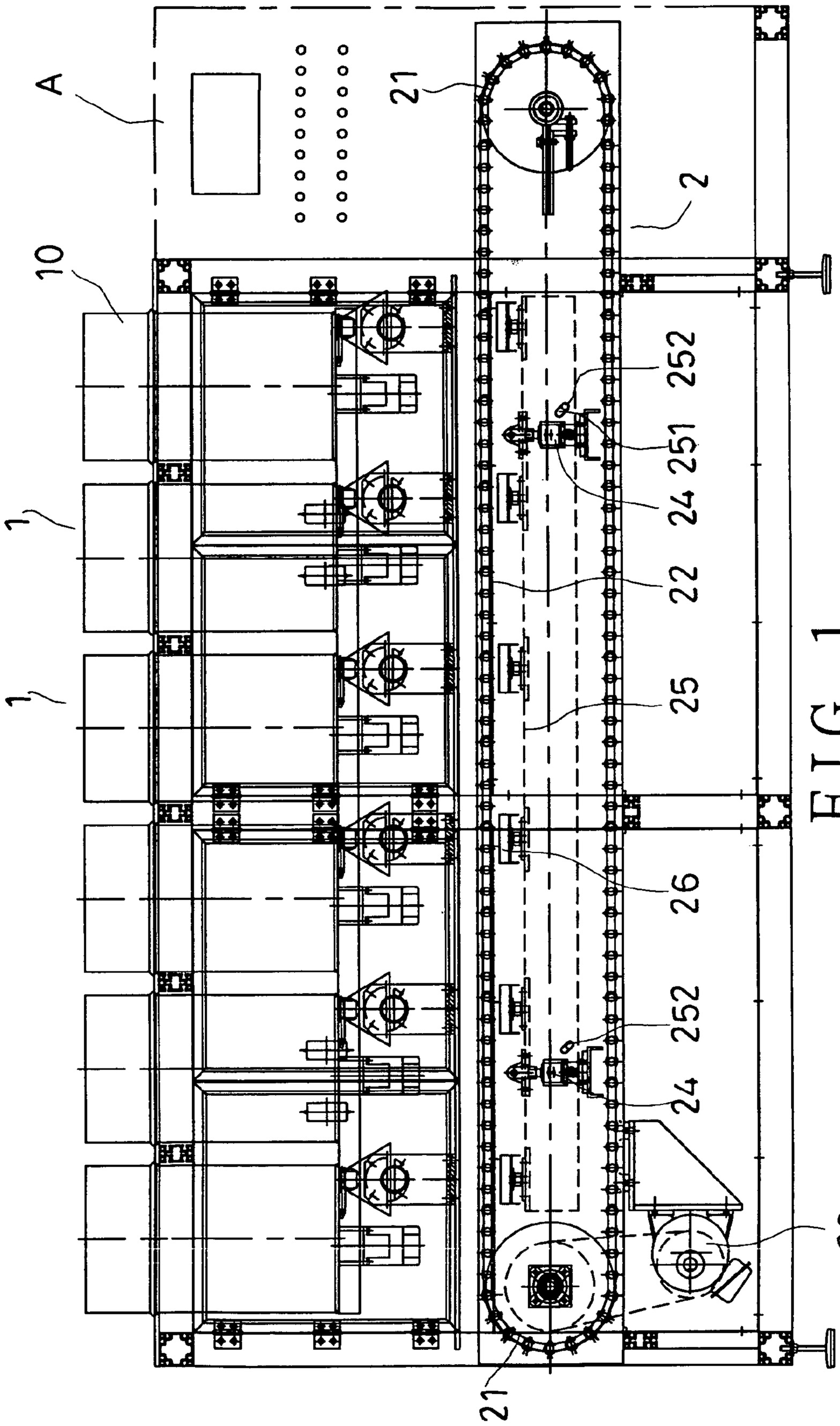


FIG. 1

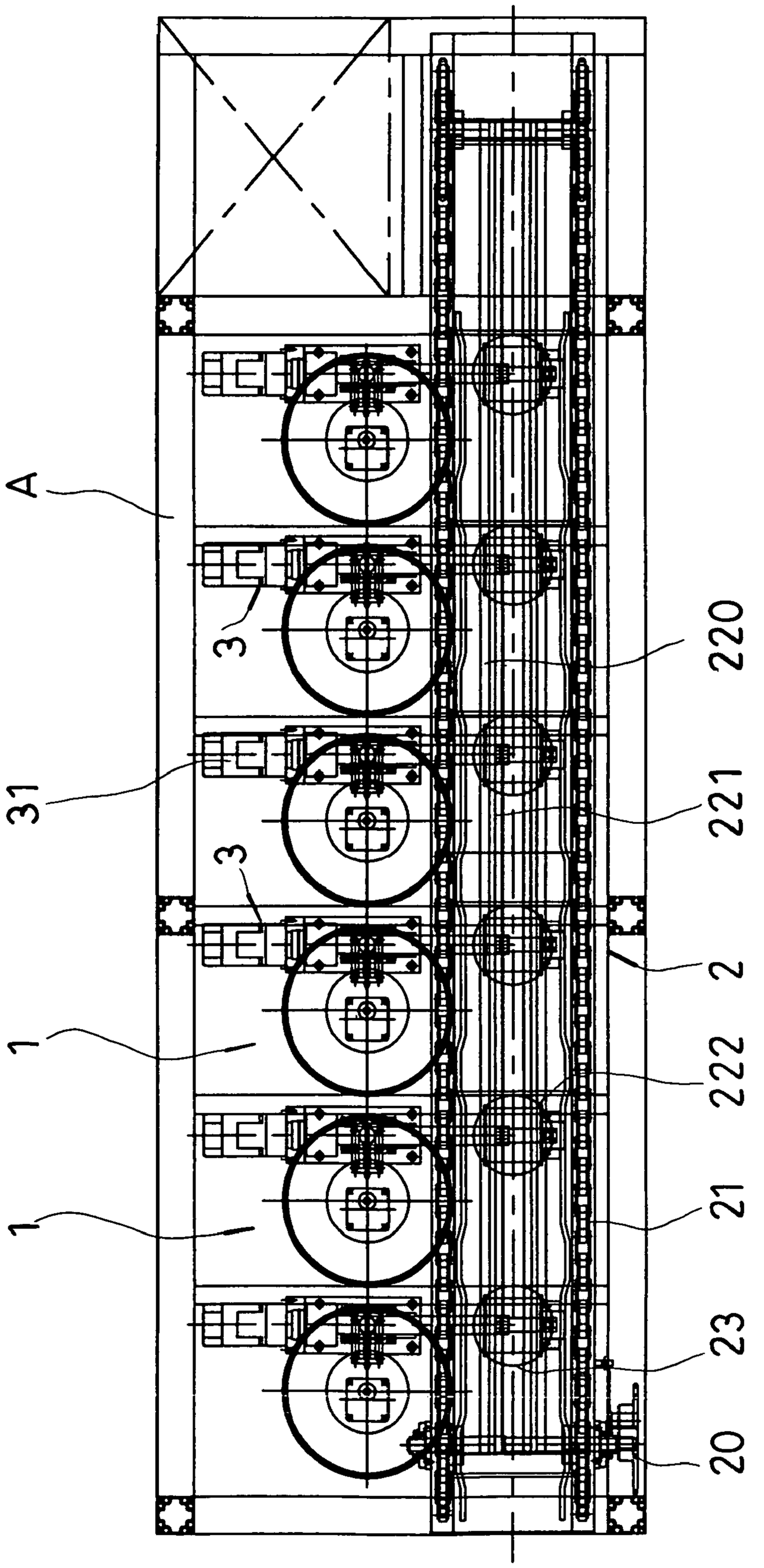


FIG. 2

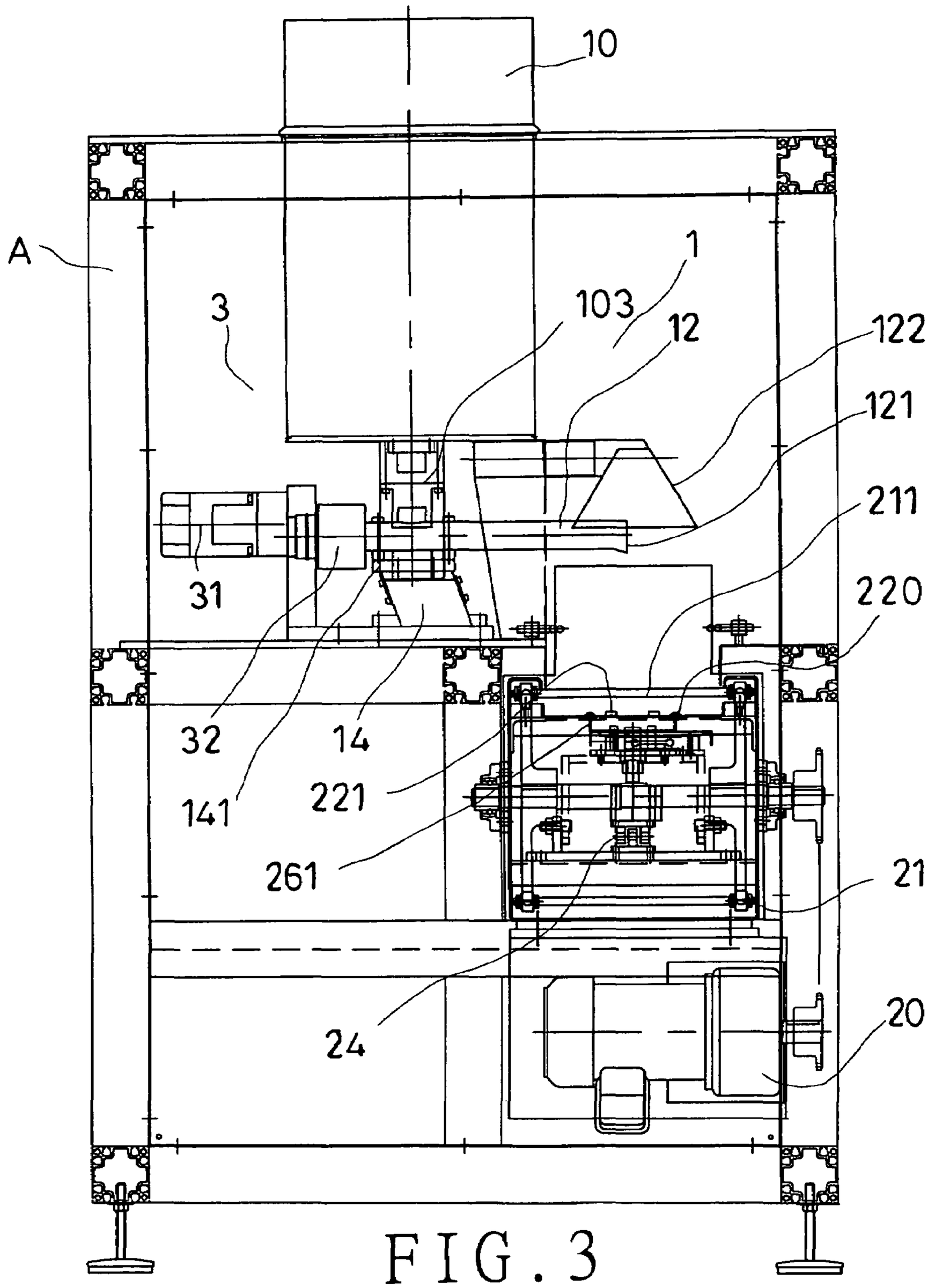


FIG. 3

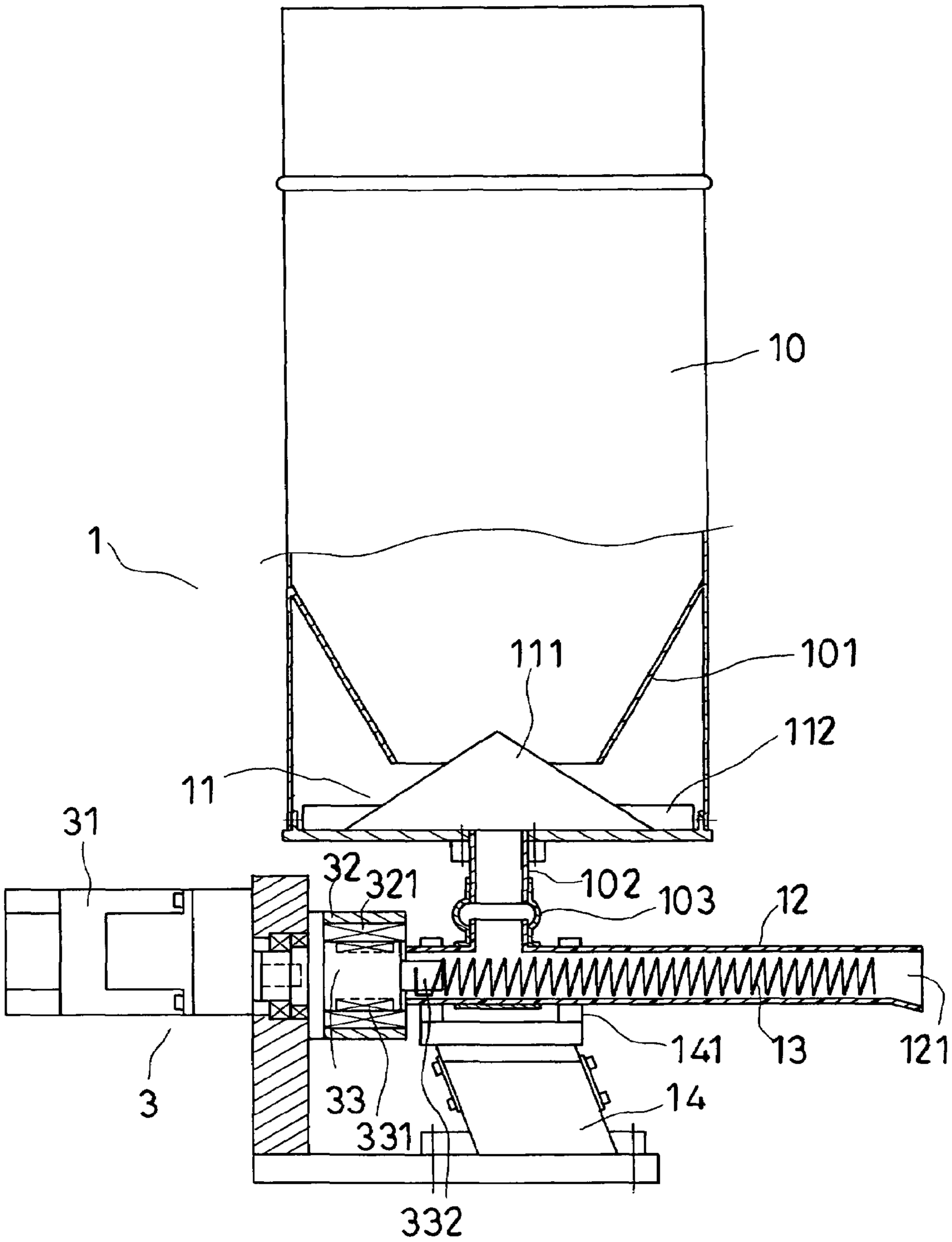


FIG. 4

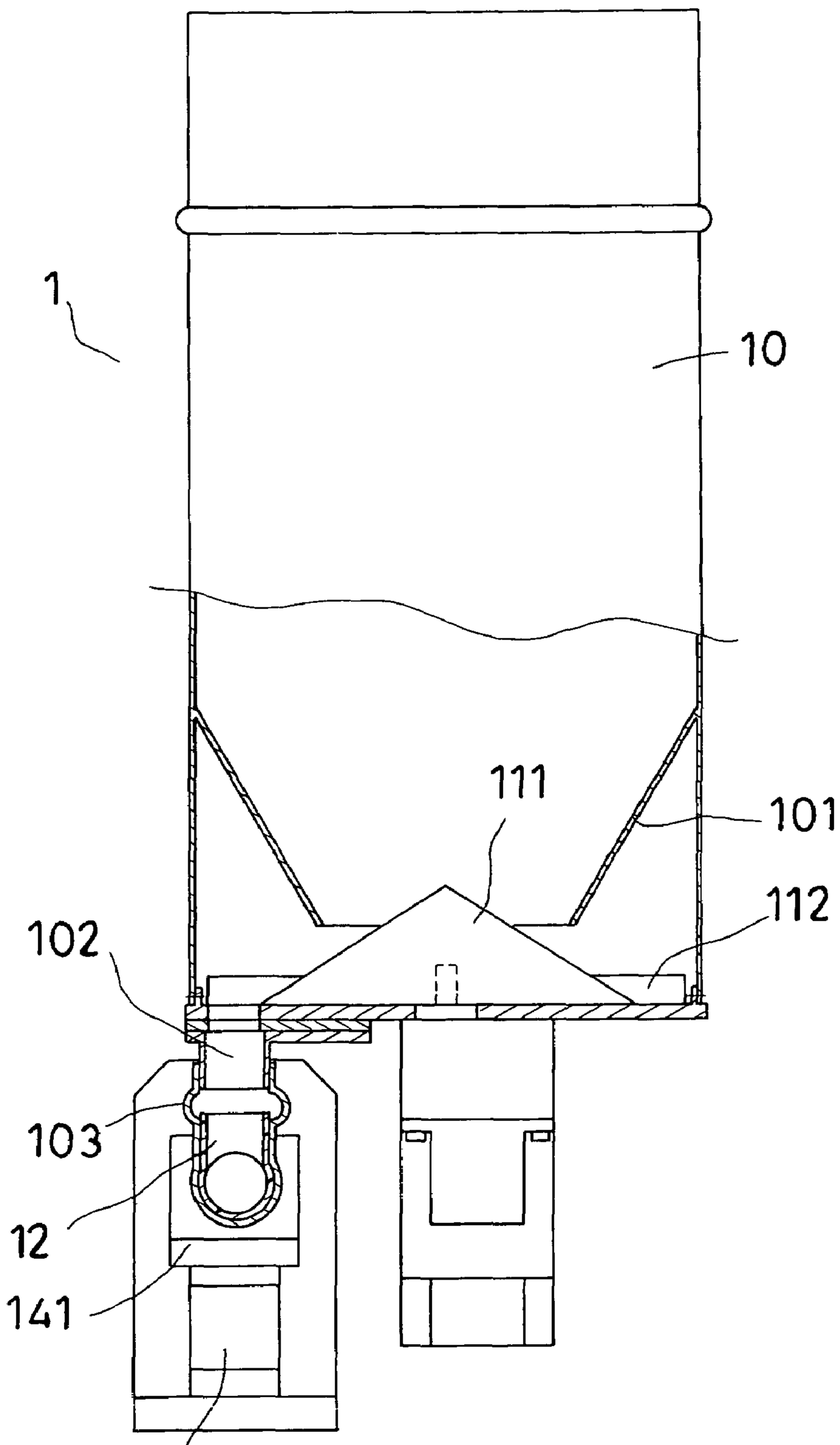


FIG. 5

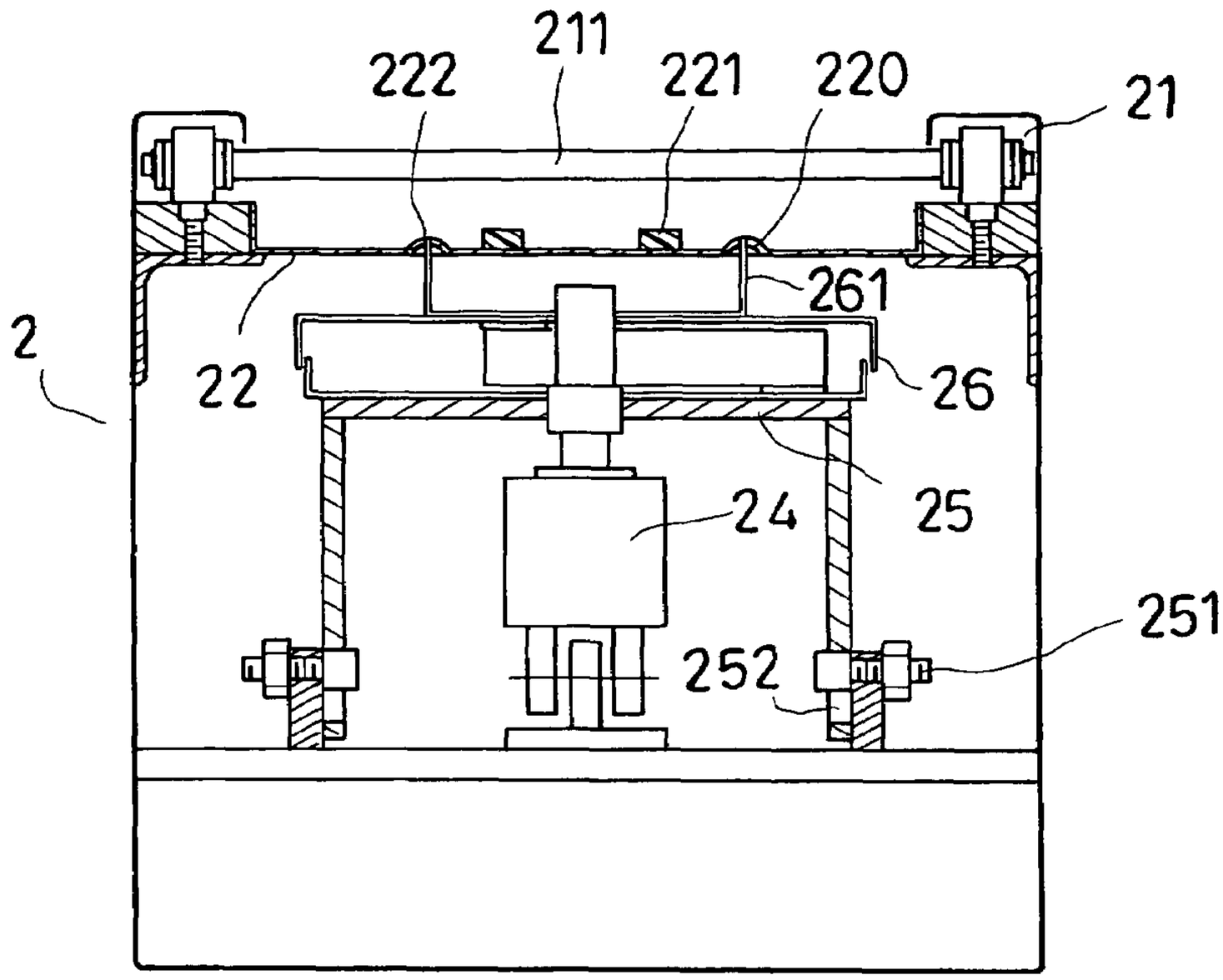

211
222
221
220
21
261
2
22
26
24
25
251
252

FIG. 6

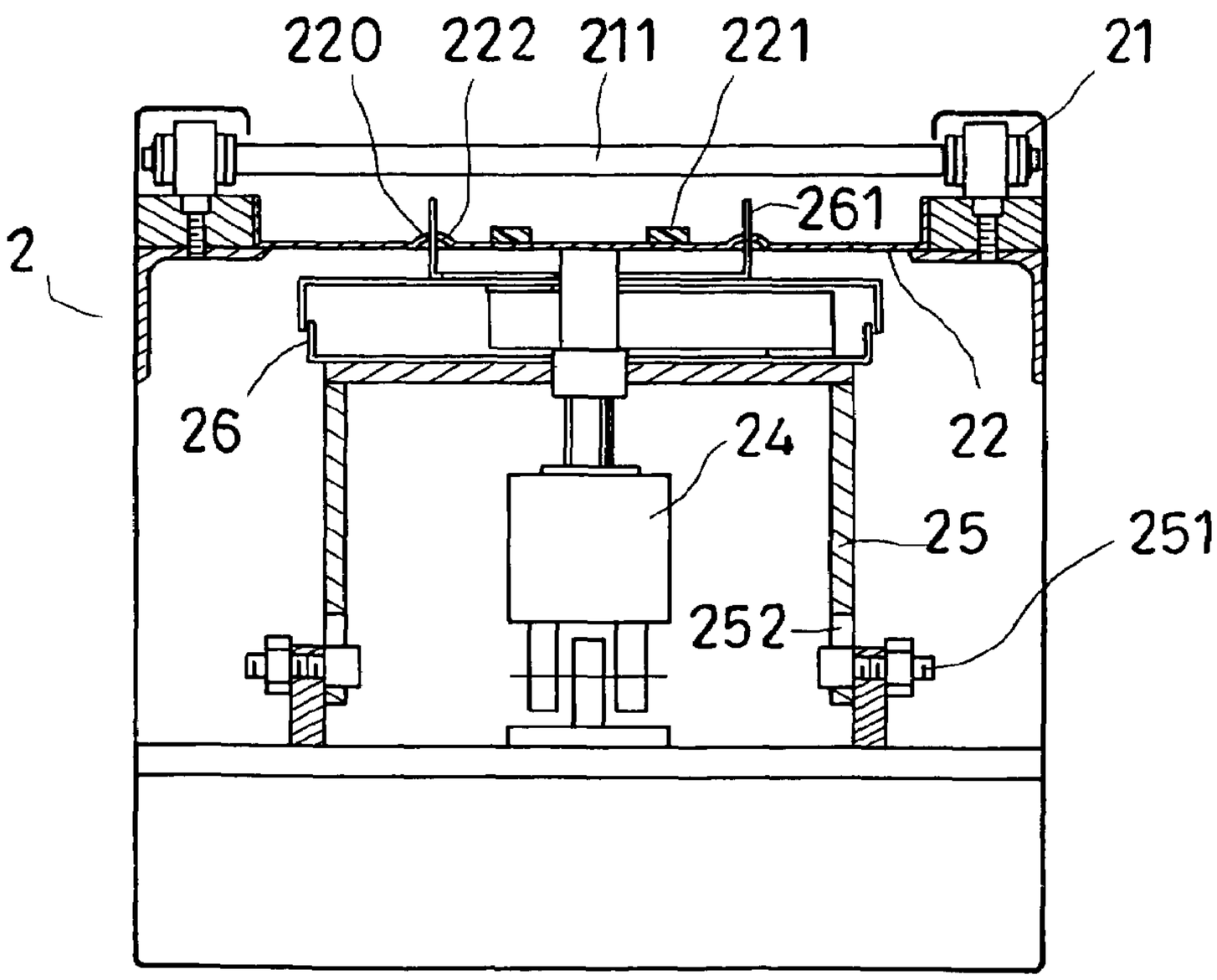

220
222
211
221
21
261
2
26
24
22
25
251
252

FIG. 8

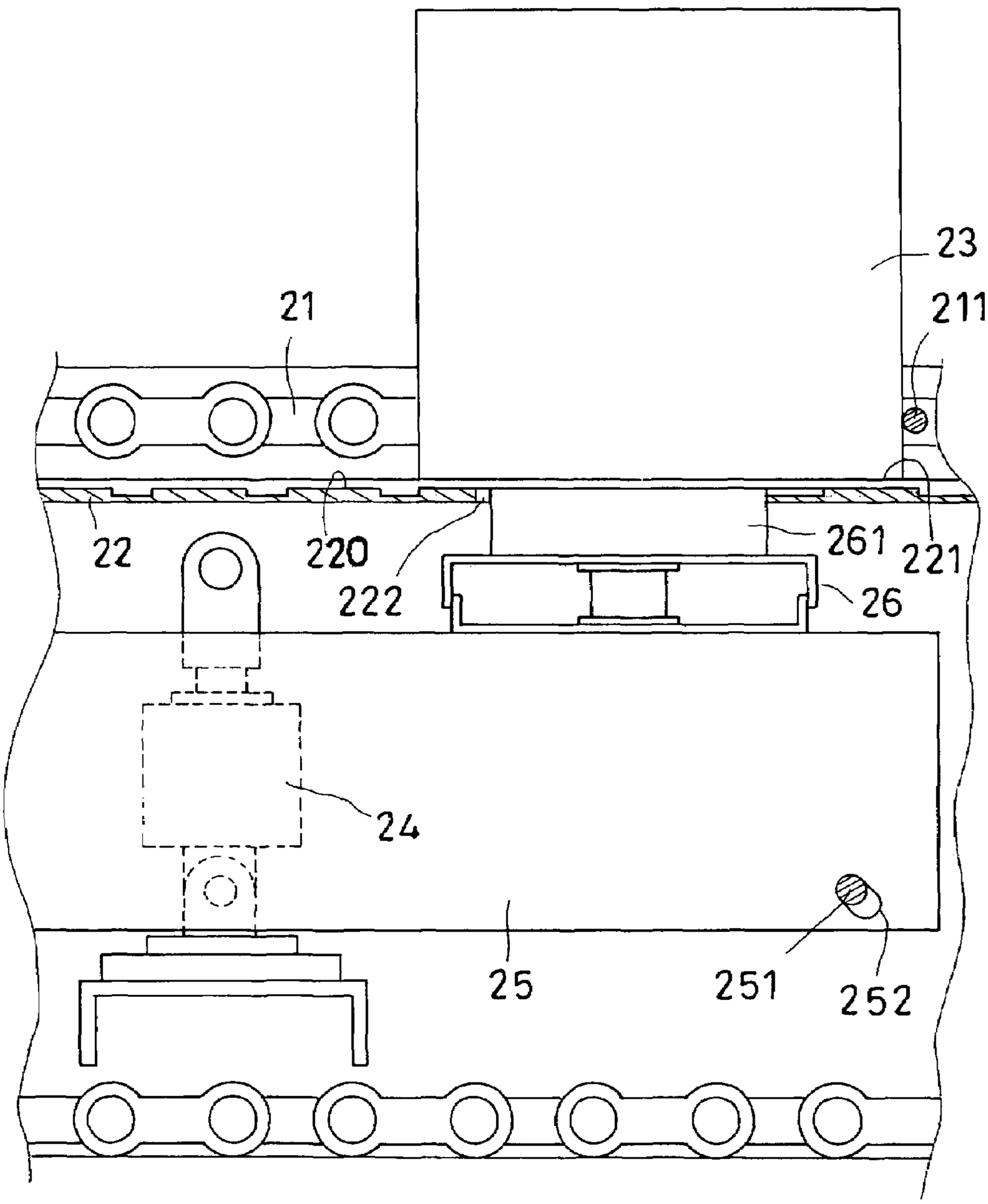


FIG. 7

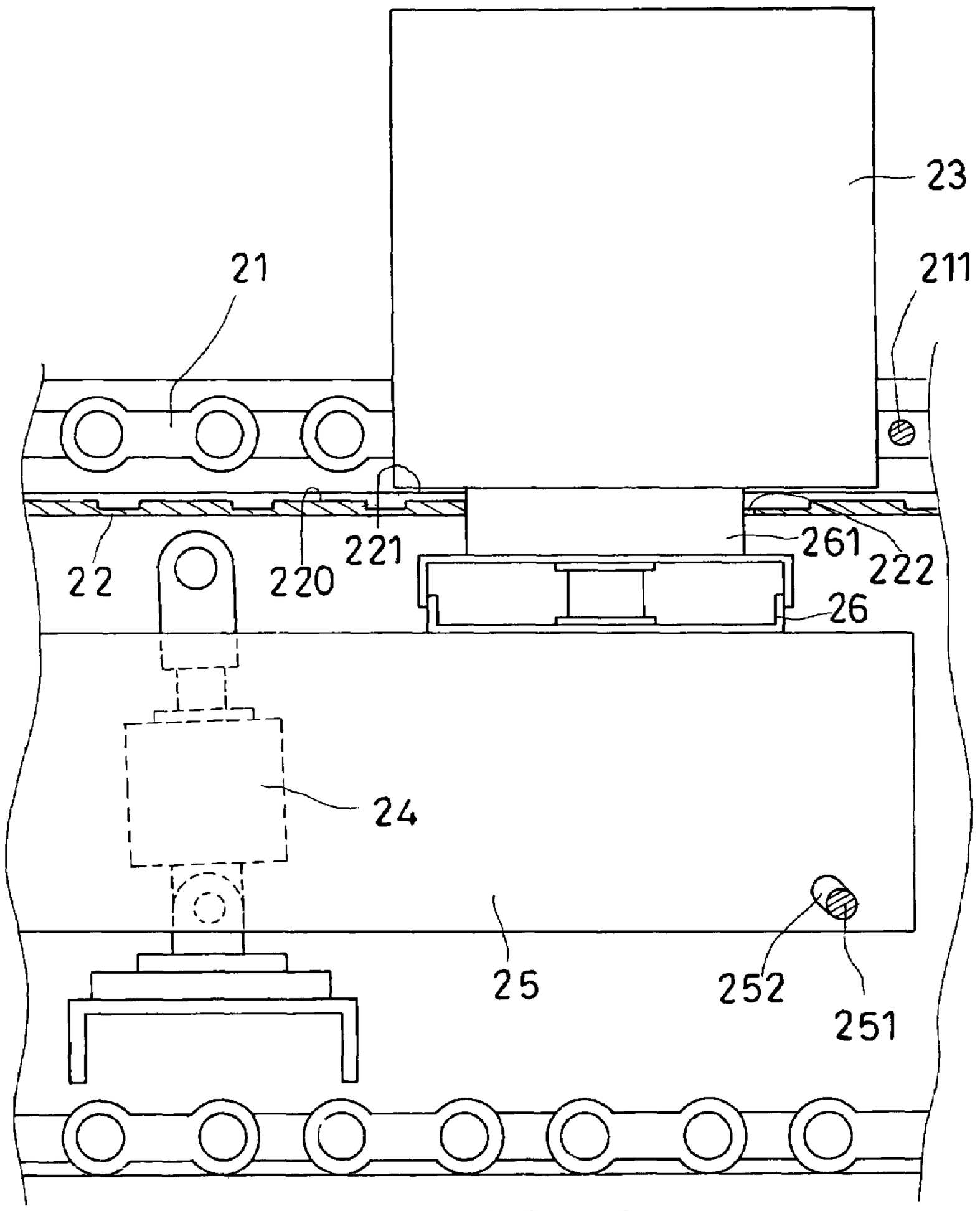
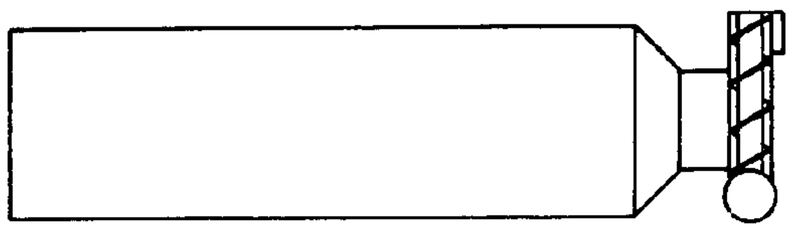


FIG. 9



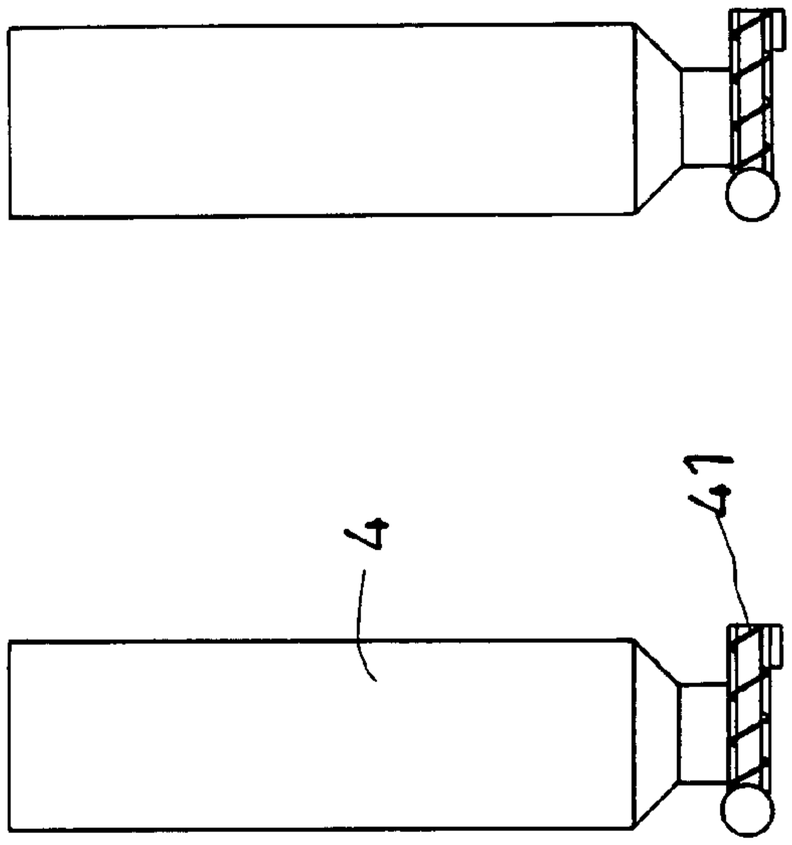


FIG. 10 (PRIOR ART)

MEASURING APPARATUS FOR MICRO-AMOUNT OF MATERIALS

BACKGROUND OF THE INVENTION

1. Field of the invention

The present invention relates to a measuring apparatus for micro-amount of materials, more particularly one, which includes several material feeding mechanisms each used for feeding a kind of material, scales and material receiving barrels as many as the material feeding mechanisms such that various kinds of materials can be added into the receiving barrels and weighed with the scales at a time.

2. Brief Description of the Prior Art

In manufacturing plastics, rubber products, foods, chemicals, and medicine, many different kinds of materials in small amount have to be added to adjust the property of the products such that function of the products are optimized. Because there are many different kinds of products, and each kind of product has many different ingredients, an accurate and fast measuring apparatus must be available for measuring the amount of various materials to be added. Currently, measurement is usually carried out manually, and inaccuracy and errors are inevitable, which can cause great loss. Furthermore, environmental factors will cause reduction to the accuracy in measurement even if automatic equipments are available. And, a manufacturing process will become inefficient if measurement of micro-amount of materials takes too much time.

Referring to FIG. **10**, a currently existing measuring apparatus includes several material containing barrels **4**, a receiving barrel **5** below the material containing barrels **4**, and a conveying device **6**. The receiving barrel **5** is supported on the conveying device **6**, and it is equipped with a scale **51** for weighing added materials. Each of the material containing barrels **4** is equipped with a threaded rod **41**, which will rotate to feed materials. In using the measuring apparatus, the receiving barrel **5** is moved with the conveying device **6**, and materials are fed into the receiving barrel **5** from the material containing barrels **4** in sequence, and weighed by means of the scale **51**. It can be easily seen that the measuring apparatus is inconvenient to use; firstly, it takes too much time for the receiving barrel **5** to receive materials fed from all of the material containing barrels **4**; secondly, if the users want to use the material containing barrels **4** to contain other kinds of materials, they first have to dismantle and wash the material containing barrels **4**, which are equipped with the threaded rods **41**, and take much time and labor to dismantle.

SUMMARY OF THE INVENTION

It is a main object of the present invention to provide an improvement on a measuring apparatus for micro-amount of materials to overcome the above-mentioned problems. The measuring apparatus of the present invention includes several material feeding mechanisms, a conveying mechanism, and receiving barrels as many as the material feeding mechanisms. Each material feeding mechanism includes a storage barrel for containing a kind of material, a rotating disk with a pushing plate in a lower end of the storage barrel, a conduit connected to an outlet of the storage barrel, an elastic element in the conduit with one end being near to an outlet of the conduit, a transmission mechanism connected to other end of the elastic element, and a vibrator connected to an outer circumferential side of the conduit. The conveying mechanism includes a conveying machine, a guiding and bearing board, a platform, a propping power source for propping the platform upwards, and several scales; the guiding and bearing board has slots thereon; the receiving barrels are positioned on the guiding and bearing board, and the conveying machine has several blocking rods next to the receiving barrels for pushing the material receiving barrels forwards; the scales are positioned on the platform for weighing materials added into the receiving barrels. Each of the scales has propping rods thereon; thus, the scales will weigh materials added into the receiving barrels when they are lifted together with the platform for the propping rods to pass through the slots and prop the receiving barrels. Therefore, various kinds of materials can be added into the receiving barrels and weighed with the scales at a time, and it will save time to use the measuring apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be better understood by referring to the accompanying drawings, wherein:

FIG. **1** is a front view of the present invention,

FIG. **2** is a top view of the present invention,

FIG. **3** is a side view of the present invention,

FIG. **4** is a sectional view of the material feeding mechanism of the present invention,

FIG. **5** is a front view of the material feeding mechanism of the present invention,

FIG. **6** is a sectional view of the conveying mechanism of the present invention (**1**),

FIG. **7** is a view of the conveying mechanism in motion (**1**),

FIG. **8** is a sectional view of the conveying mechanism (**2**),

FIG. **9** is a view of the conveying mechanism in motion (**2**), and

FIG. **10** is a front view of the currently existing measuring device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. **1** and **2**, a preferred embodiment of a measuring apparatus for micro-amount of materials includes several material feeding mechanisms **1**, and a conveying mechanism **2**.

The material feeding mechanisms **1** are held in a machine body (A). Referring to FIGS. **3** to **5**, each of the material feeding mechanisms **1** has a storage barrel **10**, a rotating disk **11**, a material conduit **12**, and a vibrator **14**; the storage barrel **10** has an outlet portion **102** at a bottom thereof, and a conical guide part **101** therein for guiding materials; the rotating disk **11** includes a conical base **111**, and a pushing plate **112** connected to the conical base **111**, and it is positioned under the conical guide part **101** of the storage barrel **10**; a coupling **103** is connected to the outlet portion **102** and the material conduit **12** at two ends; the material conduit **12** has an elastic element **13** therein; the elastic element **13** is near to a material outlet **121** of the material conduit **12** at one end, and connected to a transmission mechanism **3** at the other end; the vibrator **14** has a fixing seat **141**, and is connected to an outer circumferential side of the material conduit **12**.

Each transmission mechanism **3** has a power source **31**, an external shaft **32** connected to the power source **31**, an internal shaft **33**; the external shaft **32** has a magnetic element **321** fitted therein; the internal shaft **33** has a magnet element **331** positioned around an outer circumferential side thereof, and it is fitted in the external shaft **32**; the internal shaft **33** has a shaft end **332** connected to the corresponding elastic element **13**.

The conveying mechanism **2** includes a power source **20**, a conveying machine **21**, a guiding and bearing board **22**, the same number of material receiving barrels **23** as the material feeding mechanisms **1**, a propping power source **24**, a platform **25**, and scales **26**; the conveying machine **21** is moved by means of the power source **20**; the guiding and bearing board **22** is positioned in the conveying machine **21**, and it has several elongate protrusions **220**, and several sliding ribs **221** thereon, which are slightly higher than the elongate protrusions **220**; each of the elongate protrusions **220** has a slot **222** thereon; the material receiving barrels **23** are usually supported on the sliding ribs **221** of the guiding and bearing board **22**; the conveying machine **21** has blocking rods **211**, which are next to the material receiving barrels **23** for pushing the material receiving barrels **23** forwards; the platform **25** is positioned under the guiding and bearing board **22**, and the propping power source **24** is used for propping the platform **25** upwards; the platform **25** has sloping slots **252** on two lateral sides thereof, and insertion rods **251** are passed through respective ones of the sloping slots **252**; the scales **26** are positioned on the platform **25** for weighing materials added into the material receiving barrels **23**; each of the scales **26** has propping rods **261** thereon, which are passed through the slots **222** on the elongate protrusions **220** of the guiding and bearing board **22**.

To use the present measuring apparatus, different kinds of materials are stored in respective ones of the storage barrels **10** of the material feeding mechanism **1**, and the scale **26** is set in respect of weight proportions of the different kinds of materials. Referring to FIGS. **4**, and **6** to **9**, in operation, the power source **20** of the conveying mechanism **2** moves the conveying machine **21** with the blocking rods **211** a certain set distance, and in turn the blocking rods **211** push the material receiving barrels **23** forwards along the guiding and bearing board **22**; the material receiving barrels **23** can move along the guiding and bearing board **22** more easily because of the sliding ribs **221** on the guiding and bearing board **22**, which reduce area of contact between the material receiving barrels **23** and the guiding and bearing board **22**. When the material receiving barrels **23** are right under the material conduits **12** of the material feeding mechanism **1**, they will stops moving, and the propping power source **24** of the conveying mechanism **2** will work to prop the platform **25**, and in turn the platform **25** moves upwards in a direction parallel to the elongate sloping slots **252**, and the propping rods **261** of the scales **26** stick upwards through the slots **222** of the guiding and bearing board **22**, and prop the material receiving barrels **23** off the blocking rods **211** for allowing the scales **26** to weigh materials added into the material receiving barrels **23** and preventing contact between the blocking rods **211** and the material receiving barrels **23**, which contact would cause errors in weighing. When the material receiving barrels **23** are moved upwards to such a position as to be right under the material outlets **121** of the material conduits **12** of the material feeding mechanism **1**, the materials stored in the storage barrels **10** will fall into the conical bases **111** of the rotating disks **11** through the conical guide parts **101**, and the materials are conveyed to the outlet portions **102** of the storage barrels **10** with the help of the conical bases **111** and by means of rotation of the pushing plate **112**. Next, the materials fall into the material conduits **12** through the outlet portions **102** and the couplings **103**, and the power source **31** of the transmission mechanisms **3** work to rotate the external shafts **32**, and the magnetic elements **321** of the external shafts **32** make the internal shafts **33** rotate together with the external shafts **32** owing to magnetic attraction between the magnetic elements **321** and **331**, and in turn the elastic elements **13** connected to the shaft ends **332** are rotated to push the materials forwards. At the same time, the vibrators **14** vibrate such that the materials are moved through the material outlets **121** of the material conduits **12**, and fall into the material receiving barrels **23** by means of rotational movement of the elastic elements **13** and vibration of the material conduits **12**. The adding action is stopped as soon as the weight of added materials, which are weighed with the scales **26**, is equal to a predetermined value. Next, the propping power source **24** of the conveying mechanism **2** returns, and the material receiving barrels **23** are returned and supported on the guiding and bearing board **22**, and then the material receiving barrels **23** are pushed forwards by means of the blocking rods **211** of the conveying machine **21** for allowing other kinds of materials to be added into the material receiving barrels **23**.

Because there are the plural material feeding mechanisms **1** available for feeding respective ones of several different kinds of materials in the machine body (A), and the material receiving barrels **23** are as many as the material feeding mechanisms **1**, different kinds of materials can be added into the material receiving barrels **23** and weighed with the scales **26** at a time. Therefore, the measuring apparatus is time-efficient, capable of finishing adding and weighing materials in a relatively short length of time.

Referring to FIGS. **3** and **4**, each of the material feeding mechanisms **1** is further equipped with a dust collector **122** at the material outlet **121** of the material conduit **12**; thus, dust will be collected, which is produced when materials are conveyed forwards by means of rotating the elastic elements **13** and vibrating the material conduits **12**.

The material conduits **12** of the material feeding mechanisms **1** can be made of transparent glass such that people are allowed to see the insides of the material conduits **12** to check whether the material conduits **12** are clogged with materials.

Furthermore, rotational speed of the power sources **31** and vibratory speed of the vibrators **14** of the material feeding mechanisms **1** can be adjusted so as to adjust the length of time it takes to add materials into the material receiving barrels **23** according to the predetermined weight proportions of different kinds of materials.

From the above description, it can be seen that the micro-amount measuring apparatus of the present invention has the following advantages over the prior art described in Background:

1. Several different kinds of materials can be added into the material receiving barrels and weighed with the scales at a time because there are plural material feeding mechanisms available for feeding respective ones of several different kinds of materials in the machine body, and the material receiving barrels are as many as the material feeding mechanisms. Therefore, the measuring apparatus is more time-efficient.

2. Because the transmission mechanisms of the material feeding mechanisms are equipped with external shafts and internal shafts, which function based on principle of magnetic attraction, and because the material conduits and the elastic elements are used, the material feeding mechanisms can be easily dismantled and assembled. Therefore, the present invention is more convenient to use.

What is claimed is:

1. An apparatus for measuring micro-amount of materials, comprising

(a) a plurality of material feeding mechanisms held in a machine body, each of said material feeding mechanisms including:

a storage barrel for containing a kind of material; the storage barrel having an outlet portion at a bottom thereof;

a rotating disk with a pushing plate in a lower end of the storage barrel;

a material conduit, the material conduit being connected to the outlet portion of the storage barrel with a coupling;

an elastic element held in the material conduit; the elastic element being near to a material outlet of the material conduit at one end thereof;

a transmission mechanism connected to other end of the elastic element; and

a vibrator with a fixing seat, the material conduit being connected to the fixing seat of the vibrator at an outer circumferential side thereof;

(b) a conveying mechanism, the conveying mechanism including:

a power source;

a conveying machine actuated by means of the power source;

a guiding and bearing board in the conveying machine, said guiding and bearing board having a plurality of sliding ribs, and slots thereon;

a plurality of material receiving barrels on the sliding ribs of the guiding and bearing board, the conveying machine having a plurality of blocking rods, which are next to the material receiving barrels for pushing the material receiving barrels forwards;

a platform, the platform having sloping slots on two lateral sides thereof; insertion rods being passed through respective ones of the sloping slots of the platform;

a propping power source for propping the platform upwards; and

a plurality of scales positioned on the platform for weighing materials added into the material receiving barrels; each of the scales having propping rods thereon, which face the slots of the guiding and bearing board; the scales being going to weigh materials added into the material receiving barrels when they are moved upwards together with the platform for the propping rods to pass through the slots of the guiding and bearing board and prop the material receiving barrels.

2. The apparatus for measuring micro-amount of materials as recited in claim **1**, wherein each of said rotating disks having a conical base in the outlet portion of a corresponding storage barrel.

3. The apparatus for measuring micro-amount of materials as recited in claim **1**, wherein each of said transmission mechanisms has:

a power source,

an external shaft connected to the power source, the external shaft having a magnetic element fitted therein; and

an internal shaft, the internal shaft having a magnet element positioned around an outer circumferential side thereof; the internal shaft being fitted in the external shaft; the internal shaft having a shaft end connected to a corresponding one of said elastic elements.

* * * * *